



**Chronic Kidney Disease**

Proteinuria      eGFR

Blood Pressure      RAAS

Diabetes      ARBs

QOF

**Male aged 58**

CKD Stage ?

**Medical History**  
 Hypertension  
 Type 2 diabetes (diagnosed for 4 years)

BMI =31  
 BP = 152/88 mm Hg  
 (atenolol 100mg od)  
 UACR = 10mg/mmol

Protein dipstick: Trace  
 Creatinine = 109 µmol/L  
 eGFR = 64 ml/min

HbA1c = 8.2% (metformin & diet control)  
 Cholesterol = 5.6 mmol/L  
 HDL-C = 0.9 mmol/L  
 Fasting Triglycerides = 4.2mmol/L

**Male aged 62**

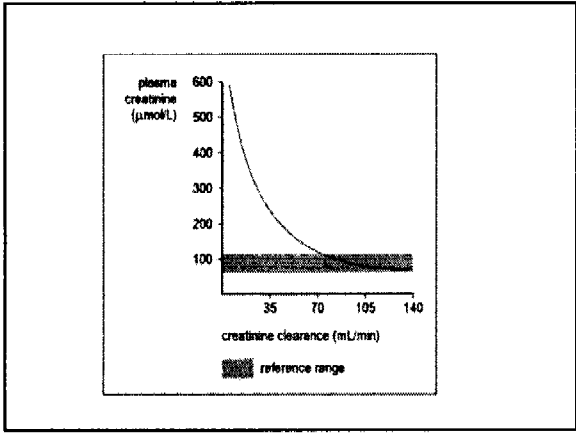
CKD Stage ?

**Medical History**  
 Hypertension  
 Proteinuria

Smoker  
 BMI = 24  
 BP = 138/78 mm Hg (lisinopril 10mg od,  
 amlodipine 5mg od, bfz 2.5mg od)  
 Protein dipstick = ++  
 UACR = 74mg/mmol  
 Creatinine 139µmol/L  
 eGFR =48 ml/min  
 Fasting glucose = 5.5 mmol/l  
 Cholesterol = 4.6 mmol/L (on simvastatin  
 40mg)  
 HDL = 1.4 mmol/L  
 LDL = 2.9 mmol/L

**Why use an Estimated GFR?**

Permits Easy Identification of CKD--  
 traditionally serum creatinine,  
 But remember physiology  
 i.e. a slightly abnormal creatinine indicates a  
 loss of 50% of renal function



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- Medical evidence  
– *Intervention can reduce ESRD and reduce CVD*

### Calculations of GFR/creatinine clearance

– Cockcroft/Gault

$$GFR = (1.2 \times [140 - \text{age}] \times \text{weight} / \text{creat})$$

– MDRD Modification of Diet in Renal Disease  
(complicated formula, but easy data)

$$GFR = 186.3 \times (\text{SCR})^{-1.154} \times (\text{age in years})^{-0.203} \times 1.212 \text{ (if patient is black)} \times 0.742 \text{ (if female)}$$

**eGFR Calculator**

**Creatinine:**  micromol/l

**Age:**  years

**Sex:**  Male  Female

**Race:**  Black  Other

**eGFR Calculator**

**GFR = 63 ml/min/1.73m<sup>2</sup>**

GFR 60-90 may correspond to stage 2 CKD in the presence of other indicators of CKD (click for guidelines)

The 90% confidence interval for this estimate is: 44-82 ml/min/1.73m<sup>2</sup>

Calculated for creatinine = 112, age = 54, sex = male, race = other

**eGFR Calculator**

**Creatinine:**  micromol/l

**Age:**  years

**Sex:**  Male  Female

**Race:**  Black  Other

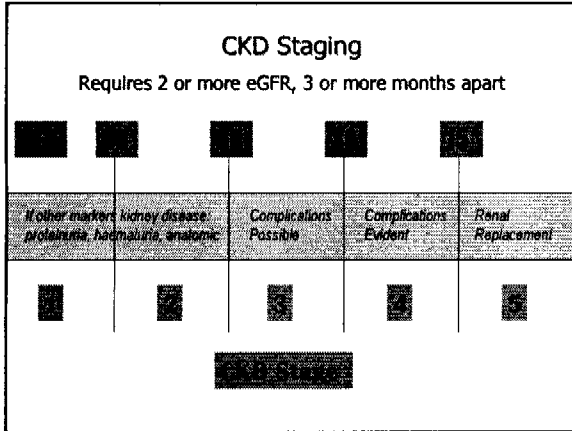
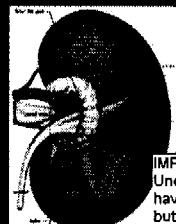
**eGFR Calculator**

**GFR = 59 ml/min/1.73m<sup>2</sup>**

GFR 30-60 corresponds to stage 3 CKD (click for guidelines)

The 90% confidence interval for this estimate is: 41-77 ml/min/1.73m<sup>2</sup>


Calculated for creatinine = 118, age = 54, sex = male, race = other

	GFR mL/min	Prev %
Stage 1	>90	3.3
Stage 2	60-89	3.0

**IMPROVING CLASSIFICATION OF EARLY CKD**  
Under the existing classification at least 4% of adults have stage 3 CKD, many of whom are elderly ... but most will not progress to end stage kidney disease.

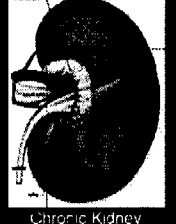
Chronic Kidney Disease



	GFR mL/min	Prev %
Stage 1	>90	3.3
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The priority should therefore be to identify those at risk of kidney disease progression.

Chronic Kidney Disease



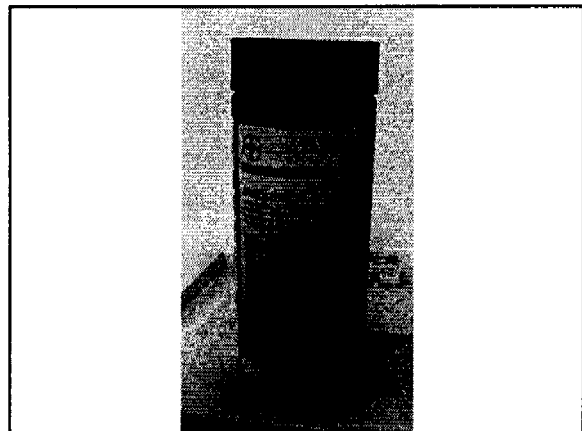
	GFR mL/min	Prev %
Stage 1	>90	3.3
Stage 2	60-89	3.0
Stage 3A	45-59	4.3
Stage 3B	30-44	

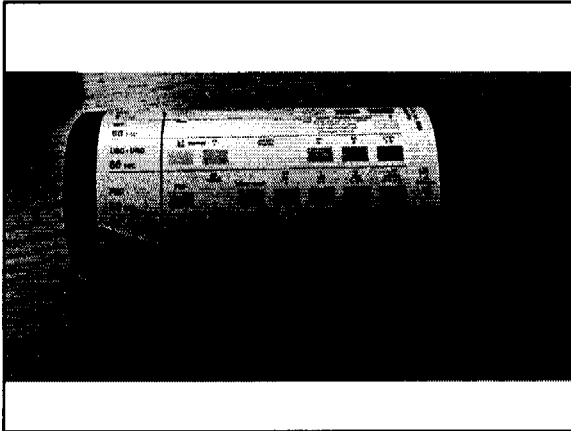
Measure serum calcium, phosphate and parathyroid hormone concentrations in people with stage 4 or 5 CKD (but not routinely in stages 1-3B)

Chronic Kidney Disease

### Stages of CKD<sup>a</sup> and frequency of eGFR testing

Use the suffix **p** to denote the presence of proteinuria when staging CKD, and define proteinuria as urinary ACR ≥ 30 mg/mmol, or PCR ≥ 50 mg/mmol.





**Urine Reagent Strips**

**Multistix 10 SG**

<b>NEG</b>	<b>Trace</b>	<b>+</b>	<b>++</b>	<b>+++</b>	<b>++++</b>
<b>g/L</b>	<b>-</b>	<b>0.3</b>	<b>1</b>	<b>3</b>	<b>≥ 20</b>

**Urinary protein excretion,  
protein/creatinine ratio (PCR),  
albumin/creatinine ratio (ACR)**

Protein excretion g/24 h	PCR mg/mmol	ACR mg/mmol
0.5	50	30

**Urinary protein excretion,  
protein/creatinine ratio (PCR),  
albumin/creatinine ratio (ACR)**

Protein excretion g/24 h	PCR mg/mmol	ACR mg/mmol
0.5	50	30
1.0	100	70

**'Do not use reagent strips to identify proteinuria'**

**Use ACR in preference to PCR**

**Clinically significant proteinuria when ACR ≥ 30 mg/mmol**

GB IR8 09 10 08

**Microalbuminuria**

**In pts with diabetes mellitus:**

**ACR > 2.5 mg/mmol (M)**

**ACR > 3.5 mg/mmol (F)**

**Testing for proteinuria**

**☑** To detect and identify proteinuria, use ACR in preference, as it has greater sensitivity than PCR for low levels of proteinuria. For quantification and monitoring of proteinuria, PCR can be used as an alternative. ACR is the recommended method for people with diabetes.

If the initial ACR is ≥ 30 mg/mmol and < 70 mg/mmol, confirm by a subsequent early morning sample. If the initial ACR is ≥ 70 mg/mmol a repeat sample need not be tested.

In people without diabetes consider clinically significant proteinuria to be present when the ACR is ≥ 30 mg/mmol.

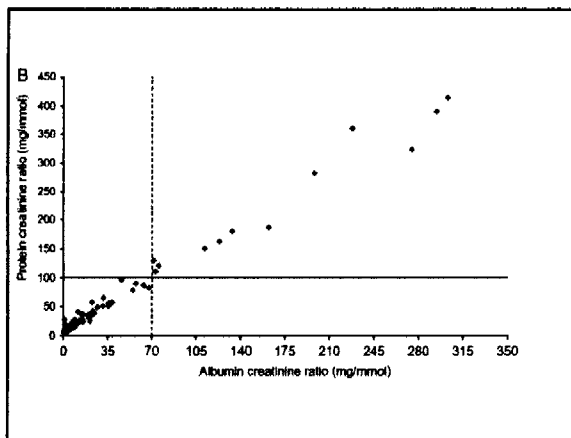
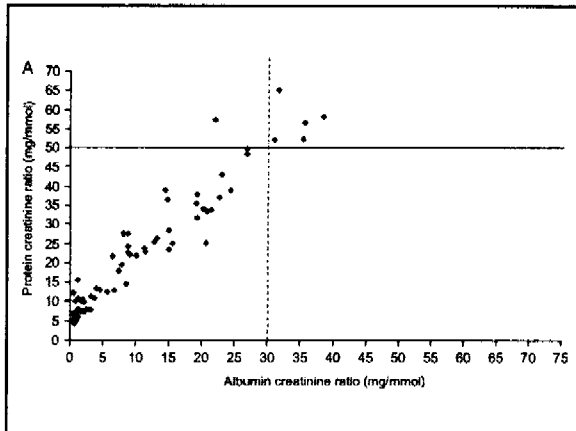
In people with diabetes consider microalbuminuria (ACR > 2.5 mg/mmol in men and ACR > 3.5 mg/mmol in women) to be clinically significant.



### A Study of the Relationship between Albuminuria, Proteinuria & Urinary Reagent Strips

To examine the relationship between proteinuria & albuminuria and to assess the equivalence between the albumin to creatinine ratio (ACR) and the protein to creatinine ratio (PCR) at the cut-offs recommended by the NICE guidance on CKD

The sensitivity & specificity of the reagent strips used in our laboratory for the detection of clinical proteinuria was also assessed.



#### The sensitivity and specificity of Bayer Multistix Dipstick

Using ACR at a cut-off  $\geq 30$  mg/mmol as the 'gold standard' for the detection of clinical proteinuria, the Bayer Multistix 10SG reagent strip reading of + had a sensitivity of 97% and a specificity of 62%.

Multistix 10SG reagent strips had an acceptable sensitivity because of the small number of false-negatives but had a poor specificity resulting in a large number of false-positives for clinical proteinuria.

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